ELECTRICAL AND MECHANICAL ENGINEERING REGULATIONS
(CANADA)

TELECOMMUNICATIONS FZ 251/3

WIRELESS SET (CDN.) No. 19, Mk. III

Operating Instructions (Instruction No. 1)

NOTE:—This information is provisional and is supplied for the use of Maintenance Personnel pending the issue of more complete instructions. All errors of a technical nature should therefore be notified through the usual channels to National Defence Headquarters (MM2).

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Instruction No. 1

OPERATING INSTRUCTIONS

Preliminary Adjustments:

1. After connecting up the batteries, headsets, control units, aerial leads and variometer according to the installation instructions, it is essential that the following adjustments and checks are made before commencing to tune the set:—

(a) Make sure that the toggle switch inside the supply unit is set to the proper position corresponding to the battery supply being used.

(b) Turn the "A" ON-OFF switch to "ON" and the "B" and I.C. ON-OFF switches to "OFF".

(c) Turn the control unit switches to "N" and "A".

(d) Turn the supply unit switch to "VIBR". Allow 30 seconds for the valves to warm up before operating any of the sets on Send.

WARNING:—IF THE "A", "B", AND I.C. SETS ARE TO BE USED SIMULTANEOUSLY THE SUPPLY UNIT SWITCH MUST BE SET TO "DYN".

(e) Take LT, HT1 and HT2 readings on the test meter. It will be necessary to turn the supply unit switch to "DYN" to get an HT2 reading. (See Table 1).

(f) Set the meter switch to AVC and turn the AVC ON-OFF switch ON.

(g) Select the proper frequency band. (2-4½ or 4½-8 Mc/s.)

(h) Select the required MCW CW R/T position.

(i) Turn the flick levers to FLICK and release the flick locking screws. Rotate both A PA TUNING and A FREQUENCY MC dials to both extremities until white flags appear in both flick windows. If use of the vernier drives is desired, the flick levers must be turned to SET; if free motion of the dials over large ranges is desired, flick levers are turned to the TUNE position.

(j) Turn the A FREQUENCY MC and A PA TUNING dials to the required frequency. Be sure to read the proper scale on the frequency dial.

(k) Centre the FLICK ADJ control.

(l) Turn R.F. GAIN and A.F. GAIN fully clockwise.

(m) Rotate the variometer for maximum background noise. This noise indicates that the receiver and aerial circuits are working.

(n) After the 30 second warm up period, press the pressel switch and take a DRIVE reading on the meter.

(o) With the "A" set on R/T blow into the microphone and listen for sidetone. This checks the headset and microphone circuits.

Tuning Operations:

TUNING THE "A" RECEIVER:

2. The tuning of the "A" receiver is performed as follows:—

(a) Search for the signal using the slow motion drive on the A FREQUENCY MC dial and moving the A PA TUNING dial to approximately the same settings. Having found the signal, tune for the maximum dip on the meter. Then readjust the A.F. GAIN until a comfortable signal is heard.

(b) Readjust the variometer, then the A PA TUNING for maximum signal strength. If a strong signal is received the maximum dip of the meter will indicate the correct setting of the tuning controls.

(c) Put the NET switch in the NET position and adjust the A FREQUENCY MC dial until the beat note is at zero. Do NOT switch to C.W. when netting. When the netting operation is completed return the NET switch to the off position.

(d) For C.W. reception turn the MCW CW R/T switch to C.W. and adjust the pitch of the signal by means of the HET TONE control.

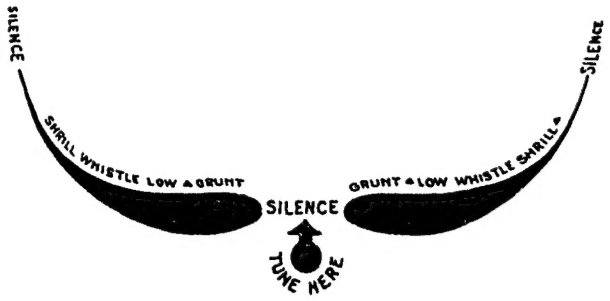

FIG. 1—TUNING TO ZERO BEAT

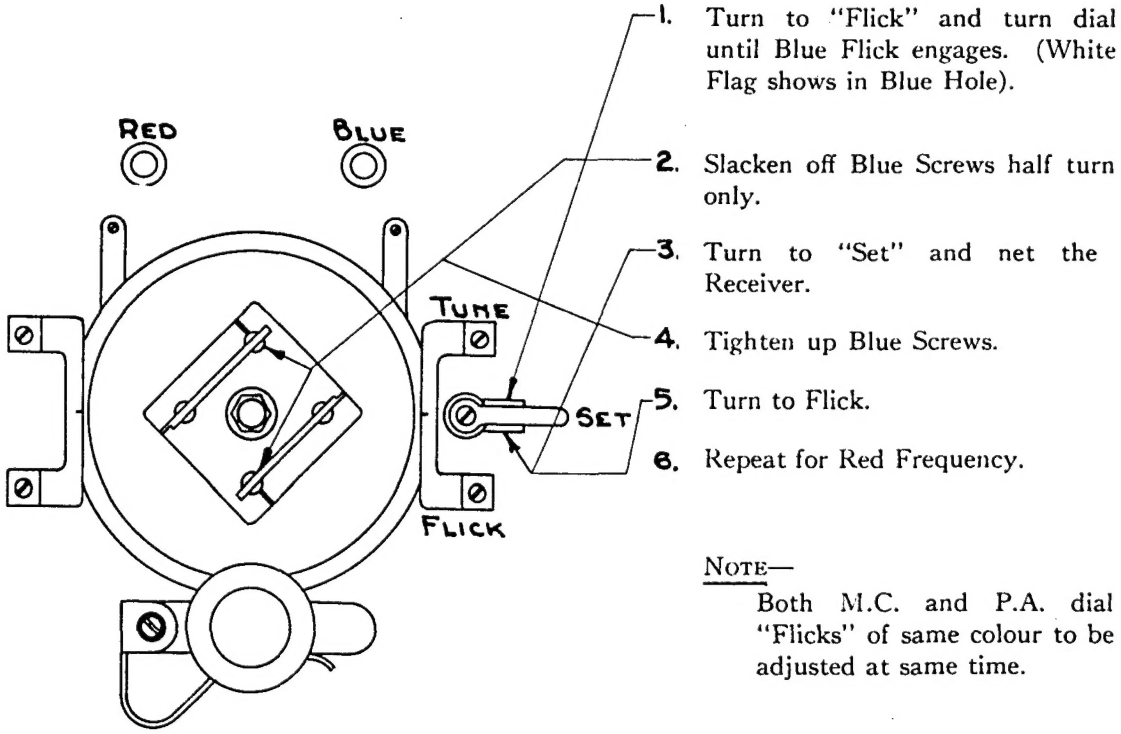

FIG. 2—SETTING UP A FLICK POSITION

TABLE 1—NORMAL METER READINGS

Meter Switch	Meter Function	Normal Readings						Remarks
AE.	Indicates Aerial Current	Frequency Mc/s.	8.0	6.0	4.5	3.5	2.5	Measured on R/T using O-15 V scale and with R.F. GAIN fully clockwise. These readings are extremely variable and no limits can be given. Readings given are merely typical of normal operations.
		Output Volts	4.0	6.0	8.0	5.5	3.0	
AVC.	Indicates Receiver Tuning	Input in Microvolts	0	100	1000	10000	100000	
		Meter Reading in Volts	6.5	3.5	2.5	1.5	1.0	
L.T.	Indicates LT Voltage Applied to Filaments	10 V.—16 V.						L.T. Voltage should be within these limits to ensure operation. Voltages below 12 V. will reduce output performance.
H.T. 1	Indicates 265 V. Supply	215 V—315 V.						These readings should be obtained when the LT voltage at the Sender/Receiver terminals is 12 V.
H.T. 2	Indicates 540 V. Supply	480 V.—560V. on "Receive"						
Drive	Indicates Drive Voltage	4.0 V.—7.0 V.						

NOTE:—The Test Meter is correct if it indicates a LT reading of 11.4 V. to 12.6 V. when the LT voltage applied to the Sender-Receiver terminals is 12 volts.

TUNING THE "A" SENDER:

3. To tune the "A" Sender, proceed as follows:–

(a) Turn the MCW CW R/T switch to the required position.

(b) Set the **test** meter switch to AE.

(c) When working on R/T, press the pressel switch on the microphone, adjust the variometer and A PA TUNING knob until the meter indicates maximum output. It is necessary to readjust both controls successively several times before maximum meter reading is obtained. Log the variometer setting.

(d) When working on C.W. or M.C.W., put the plug assembly of the key into the key jack on the set panel. If no suitable platform is found on which to rest the key, it may be strapped to the thigh. When sending, it is necessary for the plug to be pushed fully home. When working on C.W. it is necessary to press the key when tuning for maximum output; otherwise the procedure is the same as for R/T. When receiving, the plug should be partially withdrawn. If the key remains pushed in, the set stays on Send and no reception is possible.

TUNING THE "B" SET

4. "B" Set tuning procedure is as follows:—

(a) Turn the "B" ON-OFF switch to "ON" and allow 30 seconds for the valves to warm up.

(b) Turn the control unit switches to "N" and "B".

(c) Turn the GAIN B fully clockwise. A rushing noise will indicate that the receiver is operating.

(d) Press the pressel switch and the rushing noise will cease, indicating that the sender is working.

(e) Blow into the microphone and check for "B" set sidetone.

(f) Rotate the TUNING B dial until the signal is heard.

(g) Turn the GAIN B down until the signal is heard faintly and adjust the tuning dial for the clearest possible signal. Then turn GAIN B up till the signal is heard comfortably.

(h) If interference in the form of heterodyning whistles is noted, alter the setting of the QUENCH adjuster until the pitch of the whistle is too high to be heard.

OPERATION OF I.C. AMPLIFIER:

5. Turn the I.C. ON-OFF switch "ON" and allow 30 seconds for the valves to warm up. (If the "B" set has been ON, the valves will already be warmed up). Then turn the control unit switches to "N" and I.C. Press the pressel switch and speak. The operator's voice should be heard in each headset connected to the I.C. amplifier, including his own.

Aerial Equipment:

6. The "A" set is designed primarily for use with 8′, 12′ or 16′ rod aerials of the type supplied with the equipment. These rods are tuned to resonance by the externally mounted variometer.

7. Where short range communication only is required, a single 4′ mast section may be used.

8. When maximum radiation is desired without increasing aerial length, a special base adapter allows the erection of two aerial rods in a V formation. Sufficient rods are supplied to erect two 16′ sections. Two 8′ sections are the longest aerials that can be used when the vehicle is on the move.

9. For ground installations a 34′ telescoping aerial mast is often employed.

10. The "B" set uses a half-wave, end-fed, vertical rod aerial, mounted on Aerial Base No. 9. It is fed through a special coaxial feeder from the socket marked AERIAL B on the front panel of the No. 19 set, directly to the Aerial Base No. 9. Only two standard feeders are available. These are cut to correct lengths and MUST ON NO ACCOUNT BE SHORTENED.

Horizontal Aerials:

11. The aerial matching variometer on the No. 19 set artificially loads the vertical mast aerials to a quarter wave-length of the frequency being used. The impedance of the coaxial feeder to the variometer is 40 ohms, approximately. Therefore, an aerial such as the Wyndom, with its medium impedance feed is unsuitable, but a "three-quarter wave," end-fed, horizontal aerial can be used.

12. At a frequency of 3 Mc/s., 156′ of wire would be required for a half wave-length. We know that the variometer will load a 12′ mast to one-quarter wave at 3 Mc/s. If, therefore, a further 12′ of wire is added to the 156′ half-wave aerial, and the complete aerial is attached to the variometer, it will be possible for this instrument to load the aerial to three-quarter wave, for which the input impedance is approximately the same as for a 12′ mast.

13. A number of experiments have been carried out, working on this basis, and ranges up to 50 miles have been worked on speech, with strength 9 at each end. (Str. 5, new rating). This may vary with locality and climatic conditions, but it is evident that the working range of the No. 19 set can be greatly extended by this means when necessary.

14. The wire should preferably be erected as high as possible. An inverted L with the horizontal portion 30 ft. from the ground would be extremely good. However, good results may be obtained with the horizontal portion no more than 18 ft. from the ground. A quick and easy method of erecting an aerial, which will give results good enough for many purposes, is to attach one end of the wire, by means of a rope and insulator, to a tree, mast, or other support, and the other end, by means of an insulator, to the vehicle in which the set is carried, and from there to the variometer and set. The vehicle is then moved until the wire is stretched taut.

15. The aerial current, indicated by the panel meter of the set, when used with a horizontal aerial, will be of the same order as the current indicated with the 12 ft. rod. Should it be less, it does not necessarily mean that there is less radiation.

Earth Systems:

16. The use of a good earth system will improve radiation markedly. Wires, approximately half a wave-length long, should be placed radially on the ground beneath the aerial and connected to the carrier chassis. Even a simple earth pin driven into the ground near the vehicle will effect some improvement in radiation, and will avoid the noticeable drop in aerial current which occurs when personnel near the vehicle touch the parts of the chassis to which the No. 19 set is grounded. A good earth connection will often improve the signal to noise ratio on receive.

TABLE 2—"A" SET AERIAL CHART

Description of Aerial	Method of Coupling	Method of Tuning
Whip aerial (vertical). Three or four 4′ sections. (Tuned to one-quarter wave.)	Mounted on Aerial Base No 8. Connected to variometer which is connected to AERIAL A socket on panel.	Tuned for maximum reading of test meter, by successive adjustments of variometer and A PA TUNING.
Three-quarter wave, end-fed aerial (Horizontal).	Erected at the greatest possible elevation; connected to variometer, which is connected to AE socket on panel.	Tuned as above. Length of wire to cover the appropriate frequency bands should be: 2.00–2.65 Mc/s.—250 ft. 2.60–3.50 " —185 " 3.45–4.50 " —150 " 4.45–5.60 " —110 " 5.55–6.65 " — 90 " 6.60–8.00 " — 70 "
NOTE:—The lengths of wire given are the total lengths measured from the extreme end of the aerial, right to the variometer. The lead-in has to be included in the aerial measured length.		

USEFUL INFORMATION FOR AERIAL CALCULATION:

17. The physical length of an aerial is 95% of the calculated theoretical length.

$$\text{Wavelength in meters} = \frac{300}{\text{Frequency in Mc/s.}}$$

$$\text{Frequency in Mc/s.} = \frac{300}{\text{Wavelength in meters.}}$$

$$\text{One meter} = \frac{39.37}{12} = 3.281 \text{ feet.}$$

END